JONATHAN LOGAN

Postdoctoral Scholar

X-ray Microscopy Group

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Education

Ph.D. Physics, University of Chicago (2013)
M. S. Physics, University of Chicago (2006)
B. S. Physics, University of Florida (2004)

Awards and honors

Laboratory Graduate Research Fellowship (2006-2013)
NSF Sponsored Undergraduate Research (2003)
National Merit Scholarship Finalist (2000)

Research interests

- Studying the effects of geometrical confinement and strain on magnetic domain formation and phase segregation at the nanoscale.
- Developing synchrotron x-ray techniques to image 3D magnetization and strain profiles in magnetic nanocrystals and thin films.
- Fabricating and characterizing novel nanoscale magnetic materials.

Professional Experience

Argonne National Laboratory - Center for Nanoscale Materials (CNM) *Oct. 2014 - present*
Postdoctoral Scholar

- Developing x-ray techniques that combine x-ray magnetic circular dichroism (XMCD) with x-ray nano-diffraction to enable the simultaneous investigation of 3D magnetization and strain profiles in nanocrystals and thin films.
- Inventing methods to produce chemically pure, oxide-free, encapsulated magnetic nanocrystals for basic research studies and technological applications.

University of Chicago – Department of Physics *Jan. 2006 - Dec. 2013*
Graduate Research Assistant

- Invented the first technique to engineer antiferromagnetic domain walls and measured the electrical resistance across a single antiferromagnetic domain wall.
- Measured antiferromagnetic domain wall dynamics in bulk and epitaxial film chromium samples and discovered a transition from thermal to quantum mechanical activation of domain wall motion.
- Used synchrotron x-ray techniques and simulations to explain the microscopic mechanisms for spin-density wave relaxation behavior in bulk chromium samples driven out-of-equilibrium by a thermal quench.

University of Chicago – Department of Physics *Sept. 2004- Dec. 2005*
Teaching Assistant and Lab Instructor

- Led discussion and lab sections for calculus-based introductory physics courses: Mechanics; Electricity and Magnetism; Waves, Optics and Heat.

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Refereed Publications

1. **J. M. Logan**, D. Rosenmann, T. Sangpo, and I. McNulty. The effect of substrate choice on the shapes, crystalline orientations, and magnetic properties of oxide-free, tungsten-encapsulated gadolinium nanoislands (in preparation).
2. **J.M. Logan**, H.C. Kim, D. Rosenmann, P.B. Littlewood, O.G. Shpyrko, and E.D. Isaacs. Electron transport across patterned antiferromagnetic domain walls in chromium (in preparation).
3. **J. M. Logan**, R. Harder, L. Li, D. Haskel, P. Chen, R. Winarski, P. Fuesz, D. Schlagel, D. Vine, C. Benson, and I. McNulty. Hard x-ray polarizer to enable simultaneous three-dimensional nanoscale imaging of magnetic structure and lattice strain. *J. Synchrotron Radiat.,* (accepted).
4. H. C. Kim, **J. M. Logan**, O. G. Shpyrko, P. B. Littlewood, and E. D. Isaacs. Metastability and Microscopic Avalanche Dynamics in Charge-Density Waves of Chromium. *Physical Review B* **88**, pp. 140101-1 to 140101-5 (2013).
5. **J. M. Logan**, H. C. Kim, D. Rosenmann, Z. Cai, R. Divan, O. G. Shpyrko, and E. D. Isaacs. Antiferromagnetic Domain Wall Engineering in Chromium Films. *Applied Physics Letters* **100**, pp. 192405-1 to 192405-4 (2012).
6. O. G. Shpyrko, E. D. Isaacs, **J. M. Logan**, Y. Feng, G. Aeppli, R. Jaramillo, H. C. Kim, T. F. Rosenbaum, P. Zschack, M. Sprung, S. Narayanan, and A. R. Sandy. Direct Measurement of Antiferromagnetic Domain Fluctuations. *Nature* **447**, pp. 68-71 (2007).
7. Z. Wu, Z. Chen, X. Du, **J. M. Logan**, J. Sippel, M. Nikolou, K. Kamaras, J. R. Reynolds, D. B. Tanner, A. F. Hebard, and A. G. Rinzler. Transparent, Conductive Carbon Nanotube Films. *Science* **305**, pp. 1273-1276 (2004).

Non-Refereed Publications

1. O. G. Shpyrko, J. W. Freeland, D. Haskel, J. F. Mitchell, **J. M. Logan**, *et al.* "Chapter 7: Frontiers of Condensed Matter Physics" *Early Science at the Upgraded Advanced Photon Source* (Oct. 2015). Retrieved from: "https://www1.aps.anl.gov/files/download/Aps-Upgrade/Beamlines/APS-U%20Early-Science-103015-FINAL.pdf"
2. **J. M. Logan.** Antiferromagnetic Domain Wall Manipulation and Measurement in Chromium Films. PhD thesis, Department of Physics, University of Chicago (2013).
3. O. G. Shpyrko, **J. M. Logan**, Y. Feng, R. Jaramillo, T. F. Rosenbaum, P. Zschack, A. R. Sandy, M. Sprung, G. Aeppli, and E. D. Isaacs. Nanoscale dynamics of magnetic domain walls with x-ray speckle. SRMS-5 Conference, Chicago July 30- Aug. 2, 2006.
4. **J. M. Logan.** Spectroelectrochemical Study of Carbon Nanotube and Indium Oxide Thin Films. Undergraduate Highest Honors Thesis, University of Florida (2004).

Presentations

1. **J. M. Logan**. "3-D imaging of magnetization and strain at the nanoscale via dichroic Bragg Coherent Diffractive Imaging" Imaging and Microscopy Seminar, Argonne National Laboratory (2015).
2. **J. M. Logan**. "Antiferromagnetic Domain Wall Manipulation and Measurement." Center for Nanoscale Materials Seminar, Argonne National Laboratory (2014).
3. **J. M. Logan**. "Antiferromagnetic Domain Wall Manipulation and Measurement in Chromium Films." National Institute of Standards and Technology (2014).
4. **J. M. Logan**. "Antiferromagnetic Domain Wall Manipulation and Measurement in Chromium Films." PhD thesis defense talk, University of Chicago (2013).

5. **J. M. Logan,** H. C. Kim, E. D. Isaacs, O. G. Shpyrko, D. Rosenmann, Z. Cai, and R. Divan. "Antiferromagnetic Domain Wall Engineering in Chromium Films" American Physical Society March Meeting (2012).
6. **J. M. Logan.** "Engineered Spin- and Charge-Density Wave Domain Walls in Chromium Films." Seminar for the CNM Nanofabrication Group at Argonne National Laboratory (2009).
7. **J. M. Logan,** O. G. Shpyrko, E. D. Isaacs, R. Jaramillo, Y. Feng, J. W. Elam, D. J. Cookson, and M. J. Pellin. "X-ray Studies of Ultrathin Wires and Tubes in Nanoscale Confinement." American Physical Society March Meeting (2006).
8. **J. M. Logan.** "Spectroelectrochemical Study of Carbon Nanotube and Indium Oxide Thin Films." Undergraduate Thesis Talk, University of Florida (2004).

Mentoring

- **Argonne National Laboratory:** *Undergraduate research aide appointment* (Summer 2016)
  - Currently serving as a research mentor for Tenzin Sangpo from Reed College.
  - Project title: "The effect of substrate choice on the shapes, crystalline orientations, and magnetic properties of oxide-free, tungsten-encapsulated gadolinium nanoislands".

- **University of Chicago Physics/MRSEC:** *Research Experiences for Undergraduates Program* (Summer 2006)
  - Served as co-mentor for Ernesto Abruna from the University of Florida.
  - Project title: "Dynamics of Anti-Ferromagnetic Domains in Chromium".